I. Amendments to the Specification

Please replace the paragraph beginning at page 5, lines 1, 4 and 7-8 with the following amended paragraphs:

Figure 5 is ~~s~~ a schematic view of a plurality of deformation sensor elements capable of providing azimuthal resolution in accordance with the present invention;

~~Figure 6A - 6C~~ Figures 6a-6c are graphical illustrations of the approach of the side of a vehicle containing a deformation sensor element to a pole and impact therewith, in accordance with the present invention; and

Figures ~~7A - 7C~~ 7a-7c are graphical illustrations of the sensor output, corresponding to the impact depicted in Figures ~~6A - 6C~~ 6a-6c, respectively.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A vehicle 10 having several deployable restraints and including the present invention is illustrated in Figures 1 and 2. The vehicle has front 12 and rear 14 seats in a passenger compartment 16. Mounted in proximity to each seat is a seat belt 18, each of which may be equipped with pretensioners 20 as deployment restraints. Mounted in front of the two front seats 12 are front airbags 22. The illustrated vehicle 10 includes two front doors 24 and two rear doors 25, all of which may include a side airbag 26 mounted alongside, adjacent the front 12 and rear 14 seats. The vehicle 10 has a front bumper 28 with a pedestrian airbag 30 mounted in proximity to the bumper 28.

Please replace the paragraph beginning at page 8, line 32 with the following amended paragraph:

In an alternate embodiment illustrated in Figure 5, the conductive ink is arranged into several smaller strips 52 each in independent electrical communication with the restraints control module 36. In this embodiment, the smaller ink strips 52 are disposed horizontally relative to ~~eachother~~ each other, i.e., end-to-end, along a unitary flexible substrate 54. The smaller ink strips are preferably about ¼" in height

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by approximately 4" in length. As in the previous embodiment, the flexible substrate 54 is preferably about 1" in height and has a length approximately equal to the structural element being monitored. An appropriate number of smaller ink strips 52 necessary to span the length of the flexible substrate 54 is disposed on the flexible substrate 54. It has been determined that, for a typical front vehicle door 24, seven ink strips 52 of the preferable dimensions, laid end-to-end on the flexible substrate 54 provide adequate coverage of the span.

Please replace the paragraph beginning at page 9, line 30 to page 10, lines 4 and 15 with the following amended paragraphs:

The conductive ink strip 52 of the bend sensitive resistance element 50 is printed onto the flexible substrate 54. Preferably, the substrate 54 is a flexible material such as polyamide. Polyester or other suitable materials capable of providing the necessary flexibility may also be used. The flexible nature of the substrate 54 allows the bend sensitive resistance element 50 to be disposed along a non-linear surface. Also, the flexible substrate 54 provides the flexibility necessary to allow the ink strips 52 to structurally react in response to impact events, which is necessary for proper operation of the bend sensitive resistance element 50, and consequently the sensing system 35. The flexible substrate 54 may have an adhesive backing which facilitates placement on structural elements or in a housing.

The cracks are small, interspersed fissures in the ink strip 52 of the bend sensitive resistance element 50. The cracks are randomly spaced and oriented throughout the ink strip 52. The cracks are disposed along a single side of the strip 52, making the bend sensitive resistance element 50 sensitive in only one direction. When used to monitor for the occurrence of side impact events in a vehicle door 24, the surface having the cracks is typically directed toward the passenger compartment ~~26~~ 16 of the vehicle 10. As the bend sensitive resistance element 50 is bent inward, such as when a side impact occurs, the cracks open and increase the resistance of the element 50. This change in resistance can be detected by the restraints control module 36, which continually monitors the resistive output of the element 50.

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Please replace the paragraph beginning at page 11, line 15 with the following amended paragraph:

Figures 6a - 6c show an impact event involving a pole 58 and a vehicle 10 containing a sensing system 35 according to the present invention. The door 24 of the vehicle 10 contains a sensor element 38 in communication with a restraints control module 36. The sensor element 38 is positioned underneath the outer skin 42 of the door 24. The figures illustrates the physical consequences of the impact over time. As the impact progresses, the pole 58 first deforms the outer skin 42 of the vehicle door 24. As shown in Figure 6b, the sensor element 38 is not involved at this point due to its position relative to the outer skin 42. However, as shown in Figure 6c, once the impact progresses to a point where the sensor element 38 is situated, the pole 58 actually deforms the sensor element 38. At this point, the sensor element 38 is directly participating in the impact event, which is necessary for the operation of deformation sensors. As the impact progresses further, the sensor element 38 deforms further. The sensor element 38 provides an output signal 60 that, when altered, indicates the occurrence of an impact event. For example, fiber optic deformation sensors provide an output signal 60 that consists of the transmission of light. In the preferred embodiment, the resistance of the bend sensitive resistance element 50 is the output signal 60, and increases as deformation progresses due to increased opening of the cracks in the ink strip 52. The restraints control module 36 detects any change in the output signal 60, as described below, and makes a deployment decision based thereon.

Please replace the paragraph beginning at page 14, line 9 with the following amended paragraph:

For example, the particular sensor element 38 near the impact location may be used as the primary impact detection sensor, with the centrally mounted accelerometers employed as safing sensors. In this way, the characteristics of the strain detected by the sensor element 38 may be tempered by the amount of acceleration experienced by the vehicle as is detected by one or both of the accelerometers 32, 34. Another example of impact detection in which the different

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sensors are employed may include employing the accelerometers 32, 34 as the primary sensors for impact events, and modifying the thresholds for the deployment decision based upon the strain detected by a particular one of the sensor elements 38. No matter if the sensor element 38 or the accelerometers 32, 34 are utilized as the primary sensors, the azimuthal resolution provided by the sensor elements 38 can be utilized in conjunction with output from the accelerometers 32, 34 to resolve the localization and/or width for an impact event. This combination of impact information provides for a further degree of tempering, and increasing the number of possible deployment scenarios.

Please replace the Abstract following amended Abstract:

A vehicle impact sensing system for detecting impact events to a vehicle, and allowing deployment decisions of passive restraint devices based on information gathered and relayed regarding such impact events. The sensing system includes one or more sensor elements capable of directly detecting vehicle deformation occurring as a consequence of the impact event. The sensor elements generate an output that varies upon deformation of the element. The sensor elements are in communication with a restraints control module. Upon deformation of the sensor element, the control module receives impact signals from the sensor elements based upon the altered output, and discriminates between impact events that warrant deployment of a passive restraint, such as a side air bag, and those that do not. The control module utilizes information gathered from the sensor elements to make deployment decisions, such as which restraint to deploy and the appropriate degree of deployment.

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